BIOPHOTONICS PARTNERSHIP INITIATIVE

Program Solicitation

NSF 00-54

DIRECTORATE FOR ENGINEERING

DEADLINE DATE: MAY 15, 2000, 5:00 PM (your local time)

NATIONAL SCIENCE FOUNDATION

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SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Name: BIOPHOTONICS PARTNERSHIP INITIATIVE

Short Description/Synopsis of Program:

The Engineering Directorate of the National Science Foundation (NSF) announces a Biophotonics Partnership initiative seeking high risk/high return, multidisciplinary studies of novel concepts in biophotonics. Incremental advances of existing technologies will not be considered. NIH and DARPA will participate in the reviews and identify proposals of mutual interest and may provide co-funding for programs of high quality that meet their programatic and relevancy requirements. The reviews and panels will be run by NSF utilizing the NSF merit review process. All awards will be made by NSF and will be subject to NSF terms and conditions.

Program Points of Contact:

Leon Esterowitz, Bioengineering and Environmental Systems Division, NSF, Room 565, (703) 306-1318, lesterow@nsf.gov

Sohi Rastegar, Bioengineering and Environmental Systems Division, NSF, Room 565, (703) 306-1318, srastega@nsf.gov

Lawrence Goldberg, Electrical and Communications Systems Division, NSF, Room 675, (703) 306-1339, lgoldber@nsf.gov

Alan Rudolph, DARPA/DSO, 703-696-2240, arudolph@darpa.mil

Michael Marron/Abraham Levy, NIH/NCRR, Room 6160, Bethesda MD, 20892 301-435-0766, marronm@ncrr.nih.gov

Anne Menkens, NIH/NCI/EPN/800, 301-496-9531, menkensa@mail.nih.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) No.: 47.041 — Engineering Grants

ELIGIBILITY

- Limitation on the categories of organizations that are eligible to submit proposals:

  Proposals may be submitted by U.S. academic institutions and nonprofit research institutions in support of individual investigators or small groups.

- PI eligibility limitations:

  Only one proposal may be submitted by a Principal Investigator. A Prinicipal Investigator for one proposal may be a co-Principal Investigator on one other proposal.

- Limitation on the number of proposals that may be submitted by an organization: **none**

AWARD INFORMATION

TYPE OF AWARD ANTICIPATED: STANDARD GRANT

- Number of awards anticipated in FY 2000: **approximately** 5 **awards**
- Amount of funds available: **$1.5 million in FY 2000**
- Anticipated date of award: Sept., **2000**
- Duration of awards: **Up to 36 months**

PROPOSAL PREPARATION & SUBMISSION INSTRUCTIONS

- **Proposal Preparation Instructions**
  - Letter of Intent requirements: **None**
  - Preproposal requirements: **None**
  - Proposal preparation instructions: **Standard NSF Grant Proposal Guide instructions**
  - Supplemental proposal preparation instructions: **None**
  - Deviations from standard (GPG) proposal preparation instructions: **None**
- **Budgetary Information**
  - Cost sharing/matching requirements: **None**
  - Indirect cost (F&A) limitations: **None**
  - Other budgetary limitations:

    Total award amount up to $300,000 ($500,000 for essential, multi-disciplinary collaborations) for proposals submitted in response to this solicitation
- **FastLane Requirements**
  - FastLane proposal preparation requirements: **FastLane use required**
  - FastLane point of contact: **Marcia A. Rawlings, (703) 306-1318, mrawling@nsf.gov**
- **Deadline/Target Dates**
  - Full Proposal Deadline **5:00 PM your local time, May 15, 2000 (FastLane)**

PROPOSAL REVIEW INFORMATION

- Merit Review Criteria: **Standard National Science Board approved criteria**

AWARD ADMINISTRATION INFORMATION

- Grant Award Conditions: **GC-1 or FDP III**
- Special grant conditions anticipated: **None anticipated**
- Special reporting requirements anticipated: **None**

INTRODUCTION

Photonics is the technology of generating and harnessing light and other forms of radiant energy whose quantum unit is the photon. The unparalleled combination of spatial resolution, sensitivity, and spectral specificity of optical techniques has provided new biomedical research tools for visualization, measurement, analysis, and manipulation. Photonic techniques are under investigation for noninvasive diagnostic and monitoring applications such as early detection of breast cancer and glucose monitoring for people with diabetes. In 1998 the National Research Council published a report on "Optical Science and Engineering for the 21st Century". The members of the committee responsible for the report were chosen for their expertise by the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. In their Summary and Recommendations they state that *"NSF should increase its efforts in biomedical optics and pursue opportunities in this area aggressively."* Innovative basic research in biomedical photonics that is very fundamental in the science and engineering is needed to lay the foundation for new technologies beyond those that are mature and ready for application in medical diagnostics and therapies.

The intent of this initiative is to exploit the power of photonics to advance biomedical engineering. Developing noninvasive, molecularly specific sensing, imaging, and monitoring systems with high optical sensitivity, and resolution would be an enormous accomplishment with powerful applications to both biology and medicine. Low cost diagnostics will require novel integration of photonics, molecular biology and material science. Complex biosensors capable of detecting and discriminating among large classes of biomolecules could be important not only to biology and medicine but also to environmental sensing. These advances will require multidisciplinary integration of optical technologies with molecular biology in novel engineered systems.

PROGRAM DESCRIPTION

This initiative will emphasize multidisciplinary, exploratory studies of novel concepts in biomedical photonics with emphasis (but not limited) in the topical areas given below. These technologies could be used for non-invasive or minimally invasive optical imaging, monitoring, and sensing of complex systems such as tissues at the cellular level and cells at the subcellular level. Incremental advances of existing technologies will not be considered. This initiative encourages research proposals across traditional disciplines. Proposals that also include inter-disciplinary teaching/training programs for students which incorporate microscopy, spectroscopy, optical instrumentation, cell and molecular biology are desirable. An example of innovative educational programs might include the teaching of tissue optics, optical imaging, etc. that could be specifically tuned for classes/programs which bring together engineering/physics and biology/medical students (e.g. pair off eng/phy students with bio/med students for design projects, thesis work, etc.).

BIOPHOTONIC TOPICAL AREAS

1. The development of new classes of photonic probes and contrast agents to label structures and push the envelope of optical sensing to the limits of detection, resolution, and identification. Examples include:

    - New methods for fluorescent labeling of macromolecules, new compositions of matter and methods of fabrication of multicolor probes for in-vivo diagnostics, development of nanoscale encapsulated particles (e.g. semiconductor quantum dots, rare earth based fluorescent dyes, upconverting molecular ligands).
    - Photothermally and photochemically activated fluorescent-tagged polymer microspheres (e.g. glucose sensing using implanted polyethylene glycol containing concanavalin A which binds to glucose).

2. New imaging modalities and image/data fusion between optical imaging, spectroscopic techniques, and conventional medical imaging. Examples include:
    - Novel use of fiberoptic techniques, optical MEMS, and other micro-optical techniques for confocal imaging to enable endoscopic use.

- New optical approaches for non-invasive diagnosis and localization of small tumors (i.e. either entirely new methods or major removal of limitations within existing technology).

3. The development of novel optical materials and devices for biomedical applications. Examples include:
   - Development of biocompatible detection technologies that could serve as massively parallel interfaces for communicating with cells and tissue such as neural tissue (e.g. artificial eye).
   - Novel optical sources for biomedical applications (e.g. deep ultraviolet conversion techniques and high peak power short pulse, 3 ns, three-micron lasers to replace excimer lasers in ophthalmology and cardiology).

ELIGIBILITY

Proposals may be submitted by U.S. academic institutions and nonprofit research institutions in support of individual investigators or small groups. Synergistic collaboration among researchers and collaboration or partnerships with industry or government laboratories is encouraged when appropriate; however, NSF awards will be made to U.S. academic institutions and nonprofit research institutions. Only one proposal may be submitted by a Principal Investigator. However, a Principal Investigator for one proposal may be a co-Principal Investigator on one other proposal. Group and collaborative proposals involving more than one institution must be submitted as a single administrative package from one of the institutions involved. Due to the limited availability of funds, prospective applicants are strongly urged to contact one of the program officers listed at the end of this document for guidance.

AWARD INFORMATION

NSF anticipates funding awards at levels up to a total of $300,000 ($500,000 for multi-disciplinary collaborations) and 3 years duration. The final number of awards will be subject to the availability of funds and the quality of the proposals.

PROPOSAL PREPARATION & SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions.

Proposals submitted in response to this program announcement should be prepared and submitted in accordance with the general guidelines contained in the *Grant Proposal Guide* (GPG), NSF 00-2. The complete text of the GPG (including electronic forms) is available electronically on the NSF Web site at: <http://www.nsf.gov/>. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone 301.947.2722 or by e-mail from pubs@nsf.gov.

Electronic submission through the NSF FastLane system is required. Proposers are reminded to identify the program announcement number (NSF 00-54) in the program announcement/solicitation block on the NSF Form 1207, "*Cover Sheet for Proposal to the National Science Foundation*." Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Proposal Due Dates.

All proposals **MUST** be submitted electronically via FastLane by 5:00 PM, your local time, May 15, 2000. Signed proposal cover sheet must be submitted in accordance with the instructions identified below.

Submission of Signed Cover Sheet. The signed proposal Cover Sheet (NSF Form 1207) should be forwarded to the following address:

Dr. Leon Esterowitz
Program Director
Division of Bioengineering & Environmental Sciences
National Science Foundation
4201 Wilson Blvd., Room 565
Arlington, VA 22230

A proposal may not be processed until the complete proposal (including signed Cover Sheet) has been received by NSF.

C. FastLane Requirements.

Detailed instructions for proposal preparation and submission via FastLane are available at https://www.fastlane.nsf.gov/a1/newstan.htm.

Submission of Signed Cover Sheets. For proposals submitted electronically, the signed paper copy of the proposal Cover Sheet (NSF Form 1207) should be forwarded to NSF within five working days following proposal submission in accordance with FastLane proposal preparation and submission instructions referenced above.

PROPOSAL REVIEW INFORMATION

A. Merit Review Criteria.

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority serving institutions, adjacent disciplines to that principally addressed in the proposal.

Proposals will be reviewed against the following general merit review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Each reviewer will be asked to address only those that are relevant to the proposal and for which he/she is qualified to make judgments.

What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

PIs should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both NSF merit review criteria. NSF staff will give these factors careful consideration in making funding decisions.

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learner perspectives. PIs should address this issue in their proposal to provide reviewers with the information necessary to respond fully to both NSF merit review criteria. NSF staff will give it careful consideration in making funding decisions.

Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- are essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports. PIs should address this issue in their proposal to provide reviewers with the information necessary to respond fully to both NSF merit review criteria. NSF staff will give it careful consideration in making funding decisions.

B. <u>Review Protocol and Associated Customer Service Standard</u>

All proposals are carefully reviewed by at least three persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement will be reviewed by panels.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. A program officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation. In most cases, proposers will be contacted by the program officer after his or her recommendation to award or decline funding has been approved by his or her supervisor, the division director. This informal notification is not a guarantee of an eventual award. NSF will be able to tell applicants whether their proposals have

been declined or recommended for funding within six months for 95 percent of proposals in this category. The time interval begins on the proposal deadline or target date or from the date of receipt, if deadlines or target dates are not used by the program. The interval ends when the division director accepts the program officer's recommendation.

In all cases, after final programmatic approval has been obtained, award recommendations are then forwarded to the Division of Grants and Agreements for review of business, financial and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with an NSF program officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants Officer does so at its own risk.

AWARD ADMINISTRATION INFORMATION

A. Notification of the Award.

Notification of the award is made ***to the submitting organization*** by a Grants Officer in the Division of Grants and Agreements (DGA). Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator.

B. Grant Award Conditions.

An NSF grant consists of: (1) the award letter, which includes any special provisions applicable to the grant and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable grant conditions, such as Grant General Conditions (NSF GC-1)* or Federal Demonstration Partnership Phase III (FDP) Terms and Conditions* and (5) any NSF brochure, program guide, announcement or other NSF issuance that may be incorporated by reference in the award letter. Electronic mail notification is the preferred way to transmit NSF grants to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

***** These documents may be accessed electronically on NSF's Web site at: <http://www.nsf.gov/>. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone 301.947.2722 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, (NSF 95-26) available electronically on the NSF Web site. The GPM also is available in paper copy by subscription from the Superintendent of Documents, Government Printing Office, Washington, DC 20402. The GPM may be ordered through the GPO Web site at: <http://www.gpo.gov>. The telephone number at GPO for subscription information is 202.512.1800.

C. Reporting Requirements.

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

Within 90 days after expiration of a grant, the PI also is required to submit a final project report. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented a new electronic project reporting system, available through FastLane, which permits electronic submission and updating of project reports, including information on: project participants (individual and

organizational); activities and findings; publications; and, other specific products and contributions. Reports will continue to be required annually and after the expiration of the grant, but PIs will not need to re-enter information previously provided, either with the proposal or in earlier updates using the electronic system.

Effective October 1, 1999, PIs are required to use the new reporting system for submission of annual and final project reports.

D. New Awardee Information.

If the submitting organization has never received an NSF award, it is recommended that the organization's appropriate administrative officials become familiar with the policies and procedures in the NSF *Grant Policy Manual* which are applicable to most NSF awards. The "Prospective New Awardee Guide" (NSF 99-78) includes information on: Administration and Management Information; Accounting System Requirements and Auditing Information; and Payments to Organizations with Awards. This information will assist an organization in preparing documents that NSF requires to conduct administrative and financial reviews of an organization. The guide also serves as a means of highlighting the accountability requirements associated with Federal awards. This document is available electronically on NSF's Web site at: <http://www.nsf.gov/cgi-bin/getpub?nsf9978>.

CONTACTS FOR ADDITIONAL INFORMATION

General inquiries should be made to:
Leon Esterowitz, Bioengineering and Environmental Systems Division, NSF, Room 565, (703) 306-1318, lesterow@nsf.gov
Sohi Rastegar, Bioengineering and Environmental Systems Division, NSF, Room 565, (703) 306-1318, srastega@nsf.gov
Lawrence Goldberg, Electrical and Communications Systems Division, NSF, Room 675, (703) 306-1339, lgoldber@nsf.gov
Alan Rudolph, DARPA/DSO, 703-696-2240, arudolph@darpa.mil
Michael Marron/Abraham Levy, NIH/NCRR, Room 6160, Bethesda MD, 20892 301-435-0766, marronm@ncrr.nih.gov
Anne Menkens, NIH/NCI/EPN/800, 301-496-9531, menkensa@mail.nih.gov

For questions related to use of FastLane, contact Marcia A. Rawlings, (703) 306-1318, mrawling@nsf.gov

OTHER PROGRAMS OF INTEREST

The NSF Guide to Programs is a compilation of funding for research and education in science, mathematics, and engineering. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter. Many NSF programs offer announcements concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices listed in Appendix A of the GPG. Any changes in NSF's fiscal year programs occurring after press time for the Guide to Programs will be announced in the NSF Bulletin, available monthly (except July and August), and in individual program announcements. The Bulletin is available electronically via the NSF Web Site at http://www.nsf.gov. The direct URL for recent issues of the Bulletin is http://www.nsf.gov/od/lpa/news/publicat/bulletin/bulletin.htm Subscribers can also sign up for NSF's Custom News Service to find out what funding opportunities are available.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Grantees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities, and persons with disabilities to compete fully in its programs. In accordance with federal statutes, regulations, and NSF policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF (unless otherwise specified in the eligibility requirements for a particular program).

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the program announcement or contact the program coordinator at (703) 306-1636.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation regarding NSF programs, employment, or general information. TDD may be accessed at (703) 306-0090 or through FIRS on 1-800-877-8339.

We want all of our communications to be clear and understandable. If you have suggestions on how we can improve this document or other NSF publications, please email us at http://www.plainlanguage@nsf.gov.

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the review process; to applicant institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Reports Clearance Officer; Information Dissemination Branch, DAS; National Science Foundation; Arlington, VA 22230.

YEAR 2000 REMINDER

In accordance with Important Notice No. 120 dated June 27, 1997, Subject: Year 2000 Computer Problem, NSF awardees are reminded of their responsibility to take appropriate actions to ensure that the NSF activity being supported is not adversely affected by the Year 2000 problem. Potentially affected items include: computer systems, databases, and equipment. The National Science Foundation should be notified if an awardee concludes that the Year 2000 will have a significant impact on its ability to carry out an NSF funded activity. Information concerning Year 2000 activities can be found on the NSF web site at http://www.nsf.gov/oirm/y2k/start.htm.

Catalogue of Federal Domestic Assistance (CFDA) No.: 47.041 – Engineering Grants

OMB No.: 3145-0058
NSF 00-54